



Materials Engineering Branch

TIP*



No. 082 Cross-contamination During the Curing Process

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Many polymeric materials systems used in the space program require an elevated temperature bake to achieve a full cure. Other polymers require only a room temperature cure but are sometimes also oven-cured to accelerate the reaction. A polymer, when curing, will release a variety of chemicals depending upon the type and molecular weight range of the polymer.

During the cure process, the backbone of the polymer is being formed from the reactive components and, if the environment contains molecular species other than those that are part of the basic polymer, they can prevent or delay the curing process, weaken or otherwise adversely affect the product or simply contaminate the polymer by trapping these species. Since time and facilities are almost always limited, there is a natural tendency to cure different types of polymers simultaneously or, if the cure temperatures are different, to cure them consecutively without adequately cleaning the oven between the cures.

When such undesirable procedures are followed, the result can be an improperly cured or contaminated material where the cause may not be immediately evident. It is especially easy for a novice or an unsuspecting individual to use these improper techniques assuming that he/she is saving both time and money. Unfortunately, what appears to be a cost savings often ends up costing considerably more than if the proper procedures had been followed.

Cross-contamination of polymeric materials must be prevented not only during their preparation, which is not discussed here, but also during their cure cycle to avoid failures and/or substandard products. The latter can be accomplished by not curing dissimilar polymers simultaneously in the same oven. Ovens can be dedicated to a particular type of polymer or they should be solvent cleaned and baked between usages for curing different polymers.

Silicones are particularly sensitive to contamination from almost any material before the curing (polymerization) process takes place. Some of the

most damaging contaminants to be avoided are sulfur-containing compounds, water, hydrocarbons and amines. Should one or more of these contaminate the silicone, the mixture may not to cure at all or it may cure incompletely and have reduced physical properties such as strength or adhesion. To protect the integrity of any silicone polymer product, contamination during all stages of the processing must be avoided.